[0016] A similar system may be formed using small cations with neutral organic ligands in what formally appear to be a methathesis reactions, an exchange of anions. Organic amines are representative of the neutral liqand. Silver is a representative small cation and forms stable complexes with amines. Salts such as lithium bis(trifluoromethane)sulfonimide [$(CF_3 SO_2)_2N$-Li, "lithiotrifluorosulfonylamide, Li $(Tf_2)N$], BF_4^-, NO_3^-, SO_4^-, PO_4^{+3}, PF_6^- and dicyanamide [$N(CN)_2^-$] are suitable for exchange because they supply a suitable bulky anion. Such systems are readily worked-up using water to remove salt residues.

[0018] Suitable metal ions include Ag^{+1}, Zn^{2+}, Cu^{2+}, Cd^{2+}, Ni^{2+}, Hg^{2+}, Co^{3+} ions and Fe^{3+}.

[0022] The same compounds under the same conditions were reacted at a ratio of ~~cyclopexo-15-crown-5~~ cyclohexyl –15 –crown -5 to $Li(Tf)_2N$ of 1:1.35.

[0043] The RTIL of this invention are unique because they are the first such liquids having an inorganic cation complexed with a neutral organic liqand. They have conductivities comparable to the traditional EMI+ salts but are formed by different processes allowing a greater tuning by changing substituents on the organic liqand. These compounds are believed to be useful co-solvents in the separation of metal salts from contaminated aqueous systems, especially systems contaminated with soluble radioactive compounds such as those with strontium, ~~slats~~., cesium, silver, copper and lanthanum salts. They are also useful in the separation of ~~alliances~~ alkanes from olefins, with particular application to propane: propylene system. This may be useful as liquid separation membrane for gasses, as sensing transducers, electrolyte for super capacitors, as stationary phases for chromatography and as heat transfer fluids. This invention has been described in terms of representative examples. Modifications and additions obvious to those with skills in the art are subsumed within the scope of the invention.